

Claims

- [c1] 1. A method for packaging a microelectromechanical system (MEMS) device comprising:
- using a partially-cured adhesive to attach a release sheet to a MEMS package flexible layer;
- providing a cavity extending through the release sheet and at least partially through the MEMS package flexible layer;
- removing the release sheet; and
- attaching the MEMS device to the MEMS package flexible layer with a MEMS structure of the MEMS device being positioned within the cavity.
- [c2] 2. The method of claim 1 further comprising providing MEMS vias through the MEMS package flexible layer extending to connection pads of the MEMS device and applying a MEMS pattern of electrical conductors on the MEMS package flexible layer and extending through the MEMS vias to the connection pads.
- [c3] 3. The method of claim 1 wherein using the adhesive to attach the release sheet to the MEMS package flexible layer comprises coating the MEMS package flexible layer with the adhesive, partially curing the adhesive, and then attaching the release sheet.
- [c4] 4. The method of claim 3 wherein attaching the MEMS device comprises using the adhesive.
- [c5] 5. The method of claim 1 wherein providing the cavity comprises providing a cavity having a smooth-surfaced perimeter.
- [c6] 6. The method of claim 1, wherein the adhesive comprises a mixture of photodielectric and epoxy materials.
- [c7] 7. The method of claim 1, wherein providing the cavity comprises providing a cavity extending partially through the MEMS package flexible layer and further comprising, prior to removing the release sheet, providing a protective coating in the cavity.

- [c8] 8. The method of claim 7 wherein the protective coating comprises a hermetic seal on the MEMS package flexible layer.
- [c9] 9. The method of claim 1 wherein using the partially-cured adhesive to attach the release sheet to the MEMS package flexible layer comprises attaching first and second release sheets on first and second sides of the MEMS package flexible layer; wherein providing the cavity comprises providing a cavity extending completely through the MEMS package flexible layer, wherein removing the release sheet comprises removing the first and second release sheets; and further comprising attaching a cover over to the MEMS package flexible layer such that the cover overlies the cavity.
- [c10] 10. The method of claim 9 wherein attaching first and second release sheets comprises coating a first side of the MEMS package flexible layer with adhesive, partially curing the adhesive, and attaching the first release sheet; and then coating a second side of the MEMS package flexible layer with adhesive, partially curing the adhesive, and attaching the second release sheet.
- [c11] 11. The method of claim 9 wherein attaching the cover occurs prior to attaching the MEMS device.
- [c12] 12. The method of claim 9 wherein attaching the cover occurs prior to removing the second release sheet.
- [c13] 13. The method of claim 2 further comprising attaching the MEMS package flexible layer and the MEMS pattern of electrical to a multi-chip module (MCM) flexible layer; attaching a circuit chip to the MCM flexible layer; providing a substrate facing the MCM flexible layer and at least partially surrounding the MEMS device and the circuit chip; providing MCM vias through the MCM flexible layer extending to the circuit

chip and to the MEMS pattern of electrical conductors; and
applying an MCM pattern of electrical conductors on the MCM flexible layer
and extending through the MCM vias to circuit chip and to the MEMS pattern
of electrical conductors.

[c14] 14. The method of claim 13 wherein providing the cavity comprises
providing a cavity extending partially through the MEMS package flexible
layer and further comprising, prior to removing the release sheet, providing
a hermetic coating in the cavity.

[c15] 15. The method of claim 13
wherein using the adhesive to attach the release sheet to the MEMS package
flexible layer comprises attaching first and second release sheets on first and
second sides of the MEMS package flexible layer;
wherein providing the cavity comprises providing a cavity extending
completely through the MEMS package flexible layer;
wherein removing the release sheet comprises removing the first and second
release sheets; and
further comprising, prior to attaching the MEMS device attaching a cover over
to MEMS package flexible layer such that the cover overlies the cavity.

[c16] 16. A method for packaging a microelectromechanical system (MEMS) device
comprising:
coating an MEMS package flexible layer with an adhesive;
partially curing the adhesive;
using the adhesive to attach a release sheet to the MEMS package flexible
layer;
providing a cavity extending through the release sheet, the adhesive, and at
least partially through the MEMS package flexible layer;
removing the release sheet;
using the adhesive to attach the MEMS device to the MEMS package flexible
layer with a MEMS structure of the MEMS device being positioned within the
cavity;

providing MEMS vias through the MEMS package flexible layer extending to connection pads of the MEMS device; and

applying a MEMS pattern of electrical conductors on the MEMS package flexible layer and extending through the MEMS vias to the connection pads.

[c17]

17. The method of claim 16

wherein using the adhesive to attach the release sheet to the MEMS package flexible layer comprises attaching first and second release sheets on first and second sides of the MEMS package flexible layer;

wherein providing the cavity comprises providing a cavity extending completely through the MEMS package flexible layer;

wherein removing the release sheet comprises removing the first and second release sheets; and

further comprising attaching a cover over to the MEMS package flexible layer such that the cover overlies the cavity.

[c18]

18. The method of claim 17 wherein attaching the cover occurs prior to removing the second release sheet.

[c19]

19. The method of claim 16 wherein providing the cavity comprises providing a cavity extending partially through the MEMS package flexible layer and further comprising, prior to removing the release sheet, providing a hermetic coating in the cavity.

[c20]

20. A package for a microelectromechanical system (MEMS) device comprising:

an MEMS package flexible layer having a cavity extending at least partially therethrough;

the MEMS device being attached to the MEMS package flexible layer with a MEMS structure of the MEMS device being positioned within the cavity.

[c21]

21. The package of claim 20 wherein the MEMS package flexible layer has MEMS vias extending therethrough to connection pads of the MEMS device and further comprising a MEMS pattern of electrical conductors on the MEMS

package flexible layer extending through the MEMS vias to the connection pads.

[c22] 22. The package of claim 20 wherein the cavity extends partially through the MEMS package flexible layer and further comprising a protective coating in the cavity.

[c23] 23. The package of claim 22 wherein the protective coating comprises amorphous hydrogenated carbon.

[c24] 24. The package of claim 20 wherein the cavity extends completely through the MEMS package flexible layer and further comprising a cover positioned over to the MEMS package flexible layer such that the cover overlies the cavity.

[c25] 25. The package of claim 20 further comprising
a multi-chip module (MCM) flexible layer, the MEMS package flexible layer
and the MEMS pattern of electrical conductors being attached to the MCM
flexible layer;
a circuit chip attached to the MCM flexible layer;
a substrate facing the MCM flexible layer and at least partially surrounding
the MEMS device and the circuit chip;
MCM vias through the MCM flexible layer extending to the circuit chip and to
the MEMS pattern of electrical conductors; and
an MCM pattern of electrical conductors on the MCM flexible layer and
extending through the MCM vias to circuit chip and to the MEMS pattern of
electrical conductors.